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BEEF CATTLE FEEDLOTS: A POTENTIAL MARKET FOR FGD BY-PRODUCTS?

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Title IV of the 1990 Clean Air Act mandates a 10 million ton (40 percent) reduction, from 1980 levels, in the nation's sulfur dioxide emissions by the year 2000. Also, nitrogen oxide emissions are to be reduced by two million tons (Clausen). Under this Act, electric utility companies are to reduce emissions below ceilings established by the U.S. Environmental Protection Agency, but companies are allowed to choose the methods to achieve emissions reduction. They may retrofit existing plants with pollution control technology, use fuels with lower sulfur content, purchase emission allowances (or rights-to-pollute) from other companies, reduce fuel consumption, or some combination of these emission reduction methods. Pollution control technology includes flue gas desulfurization (FGD), which uses a sorbent to "scrub" sulfur dioxide from the emissions. This process creates a by-product, the used sorbent, that must be marketed or disposed.

One potential market for the FGD by-product is surface paving material. Recently, interest has been expressed in its use in Ohio beef cattle feedlots (Beeghly). The purpose of this paper is to investigate some economic issues related to the use of FGD by-product as a cattle feedlot surface material. Cattle feeding has been in a persistent decline in Ohio, as evidenced by

cattle marketings declining from 858,000 in 1975 to 395,000 in 1992 (USDA). Would supplying the cattle feeding industry with a low, or zero cost surface material improve the profitability of Ohio cattle feeding? Would it affect the future economic viability of Ohio cattle feeding?

Fundamental Economic Issues in Cattle Feeding

Consumer Demand

The cattle feeding industry can be characterized as facing stagnant consumer demand, and specialization and concentration of production. Until the mid-1970s cattle feeding was an expanding industry due to rising population and increasing per capita beef consumption. Since that time consumer preferences have changed. While demand for meat has increased, health conscious consumers have shifted away from beef to other meats. Per capita consumption of red meat, poultry and fish was 194 pounds in 1991, a 13 percent increase over 1975 consumption. Since 1975, per capital consumption of pork has remained steady (46.9 pounds in 1991), poultry has nearly doubled to 66.7 pounds, and fish has increased sightly to 15.4 pounds. However, per capita consumption of beef has declined from 83.0 to 63.9 pounds, and total U.S. beef production has reached a plateau (Figure 1).

Location of Production

Beef feeding has concentrated in the Plains States (Figure 2). Five states - Texas, Nebraska, Kansas, Colorado, and Oklahoma - accounted for 50 percent of U.S. cattle marketings in 1990; their share was 30 percent in 1960. On the other hand, cow-calf herds are dispersed widely (Figure 2). Cow-calf operations tend to be located on marginal land and provide a method to market forage from pasture land that has little or no alternative use. Once calves

reach 450 to 650 pounds, they are shipped to feedlots for fattening with concentrates.

One of the reasons for the increased concentration of cattle feeding in the Plains States was the development of irrigated grain sorghum production in those states to supply needed concentrate feeds. This development was stimulated partly by increased feed grain prices in the early-1970s resulting from increased export opportunities. Until that time, the U.S. was essentially self-sufficient in feed grains. After that, it produced about one-fourth of its feed grains for an export market. Much of the feed grain exports came from the east North Central region, which in essence, increased feed prices for this region's beef feeders. Another factor contributing to cattle feeding concentration in the Plains States was an efficient transportation system that allowed feeder calves to be shipped to feedlots and beef products to be shipped to distant population centers at low cost. Also, fed beef housing and manure disposal costs were substantially less in the Plains States than in the North Central region.

Gains in beef feeding in the Plains States came, in large part, at the expense of farmers in the eastern portion of the North Central region, which includes Ohio (Figure 3). The share of U.S. cattle marketings coming from the east North Central region declined from 14.2 percent in 1960 to 6.4 percent in 1990. In addition to east North Central states, Iowa, Minnesota, and Missouri lost substantial market share. The market share of these eight states (Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Minnesota, and Missouri) declined from 33 percent in 1960 to 16 percent in 1990. So, the location of beef feeding has changed dramatically. Thirty years ago, the eight-state Corn

Belt region fed the same amount of beef as the five-state Plains States region; today, it feeds one-third as many.

Industry Structure

These regional shifts resulted in a more geographically concentrated fed beef industry, and also produced a more concentrated industry structure with fewer, larger firms (Figure 4). The industry's production continues to shift to feedlots with more than 1,000 head capacity, and only 15 percent of fed beef are produced in feedlots with less than 1,000 capacity. Most feedlots in the east North Central region are farmer feedlots with less than 1,000 head capacity. On these farms, beef feeding is typically one enterprise among several on the farm.

Costs and Returns

The U.S. Department of Agriculture annually estimates average costs of production and returns for fed cattle production. Returns and costs are estimated for the two types of cattle feedlots: commercial feedlots and farmer feedlots. The estimates are based on financial and technical data obtained from producer surveys in Illinois, Iowa, Minnesota, Nebraska, and Kansas (USDA, ECIFS 10-5). Existing Ohio feedlots would most closely resemble the "farmer feedlots" depicted by USDA. Even large Ohio feedlots, those approaching 1,000 capacity, would resemble farmer feedlots because commercial feedlots represented in USDA estimates are Plains States feedlots which have relatively low building and lot investments.

Economic costs include all cash operating expenses, depreciation of facilities, interest charge for all capital (operating capital and investment in facilities), and labor charge for all hired and unpaid family labor. Over

the 1972-90 period, costs averaged more than receipts from cattle marketings; average residual returns (returns minus economic costs) were -$1.89 per cwt.

However, residual returns were higher for commercial lots. The average commercial feedlot received a rate of return on capital investment that was comparable to off-farm investments with a similar degree of financial risk (Crisostomo and Featherstone). Losses and low returns to capital investment were incurred primarily by farmer feeders.

On average, about 90 percent of the economic cost for fed cattle consists of expenses for purchasing the feeder calf and feed (Figure 6). Farmer feedlots typically purchase feeder calves at lighter weights and feed them longer than commercial feedlots. Thus, farmer feedlots have higher feed costs and lower feeder calf costs per hundred weight of beef produced than commercial feedlots. There are substantial differences between commercial and farmer feedlots in labor and capital costs. Examples of labor inefficiency on farmer feedlots are observed in feeding, bedding, manure removal, and health care activities. Lower per unit capital costs on commercial feedlots reflect cost advantages due to scale economies and lower per unit investments in housing and feeding systems.

The cost estimates for 1990 (Figure 7) highlight the cost disadvantages faced by farmer feedlots. In 1990, economic costs were about $8 per hundred pounds higher for farmer feedlots than for commercial ones. Furthermore, Ohio farmer feedlots may face slightly higher feed costs than the average farmer feedlot pictured by these data. Feed grain prices at the farm level usually are higher in Ohio than in the western Corn Belt states (Iowa, Minnesota, and Nebraska) where USDA's farmer feedlot cost estimates originate. Given these

cost comparisons, it is little wonder that abandoned cattle feeding facilities are a common sight in rural Ohio.

Is FGD By-Product a Remedy?

If FGD by-products were furnished at low, or zero cost to the Ohio cattle feeding industry, capital costs would be reduced. Concrete may account for as much as one-fourth of the investment in housing and lot facilities (Forster et al.). However, the impact of excluding concrete floor investment on USDA's cost of production estimates is minimal (Figure 7). Capital costs decline by $0.20 per hundred pounds - about the same magnitude as bedding costs - for the farmer feedlot if concrete costs are excluded.

Another potential effect of using the FGD by-product to pave existing feedlot surfaces is that feeding efficiency and weight gain could be enhanced. The reason housing investments are relatively high in Ohio and other Corn Belt states is that cattle need to be sheltered from wet weather that turn open lots into mud during some periods of the year. Muddy feedlots cause animals to expend more energy, reducing feed efficiency and weight gain. Typically, Ohio farmer feedlots are constructed with housing and a partially paved lot. During wet periods, the cattle have only partial reprieve from muddy surfaces. Computer simulation models were used to estimate the effect of muddy feedlot surfaces on production costs (Boyles). Feed costs averaged $1.02 per hundred pounds higher for feedlots with muddy lot surfaces than for those with paved lot surfaces. That is, average cost per hundred pounds would decrease from $84.89 to $83.87 if farmers pave portions of their feedlots that are muddy.

A third advantage of using FGD by-product on feedlot surfaces is that it would increase the market price of the livestock. Buyers pay less for beef that are coated with mud because it is apparent that there will be a lower

percentage of dressed beef. However, producers should receive the same gross revenue for each animal whether it is clean or not. The per pound price discount for mud coated animals is offset by the added weight of the mud. The buyer is paying for the quantity of dressed beef in the animal, and the purchase price is adjusted to compensate for wastage.

Implications

The use of this by-product on farmer feedlots offers farm level benefits, but the distinct cost disadvantage faced by the Ohio farmer feeder would be affected only slightly. Potential benefits to Ohio farmer feedlots of supplying free feedlot surfacing material are estimated to be: (a) reduced capital costs totalling $0.23 per hundred pounds of beef and (b) reduced feed costs of $1.02 per hundred pounds. While the profitability of Ohio feedlots would be improved, their competitive position in the U.S. beef feeding industry would remain about the same. Currently, costs on the average U.S. farmer feedlot are estimated to be $8.19 higher than costs on the average commercial feedlot, and there is reason to suspect that this cost difference is even greater for the average Ohio feedlot. Like the effect a thimble full of water has in relieving thirst, low cost FGD by-products would be beneficial, but they would have relatively little effect on the parched economic conditions in Ohio beef feedlots.

While Ohio beef feedlots would receive benefits from low, or zero cost surface material, suppliers might also benefit. Electric utility companies using the FGD technology generate a by-product that must be marketed in a beneficial use or disposed. Disposal by landfilling is likely to be costly; therefore, marketing the FGD by-product as feedlot surface material or other

beneficial products need might be profitable for the company, even though cash receipts from the products are negligible.

Finally, a beneficial use for the FGD by-product, like using it as a feedlot surface material, could have substantial indirect benefits for communities. If beneficial uses are not utilized, landfills would impose "external" costs on communities, which are reflected in the depressed market value of real estate neighboring landfills.

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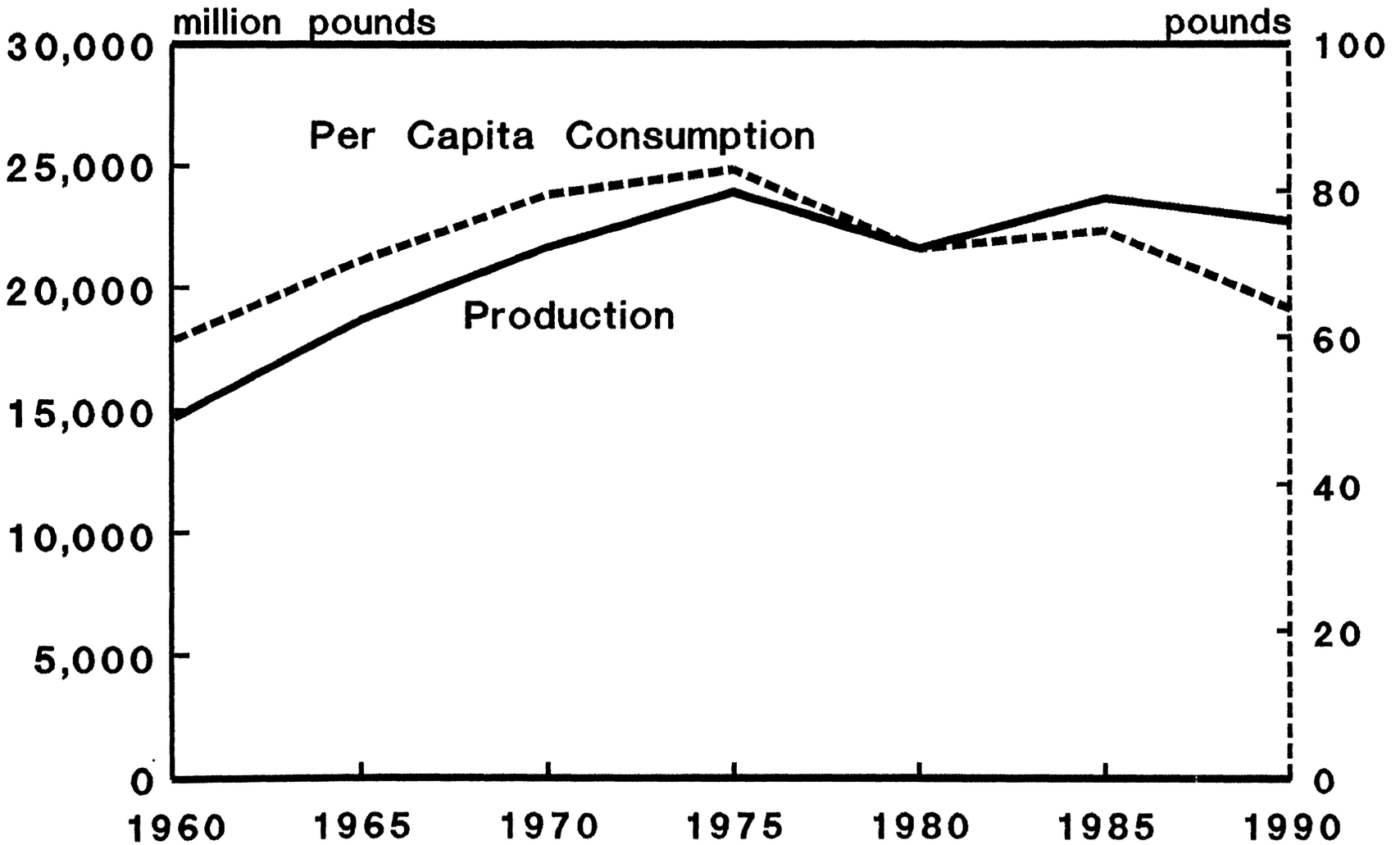
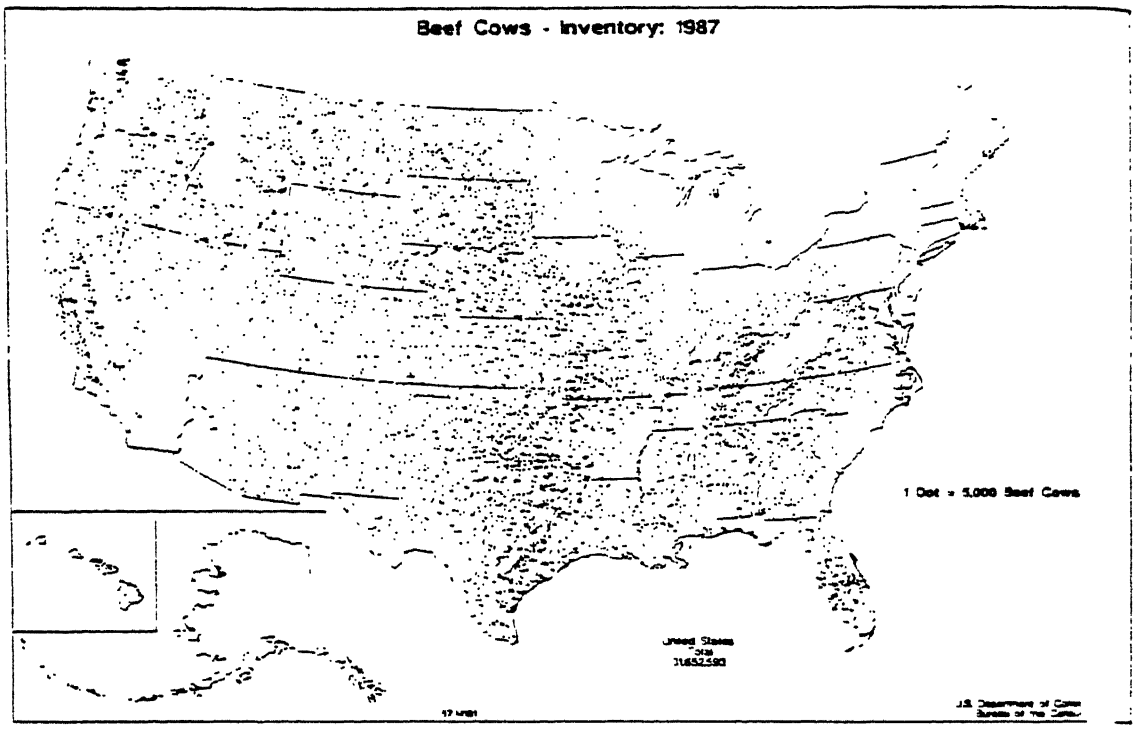
Figure 1. U.S. Beef Production and Per Capita Consumption



Source: Derived from USDA statistics compiled in Stout, T.T. "U.S. Production and Consumption of Beef, Pork, and Poultry, 1950-2000." ESO 1935, Department of Agricultural Economics and Rural Sociology, The Ohio State University, April 1992.

Figure 2. Location of U.S. Beef Production



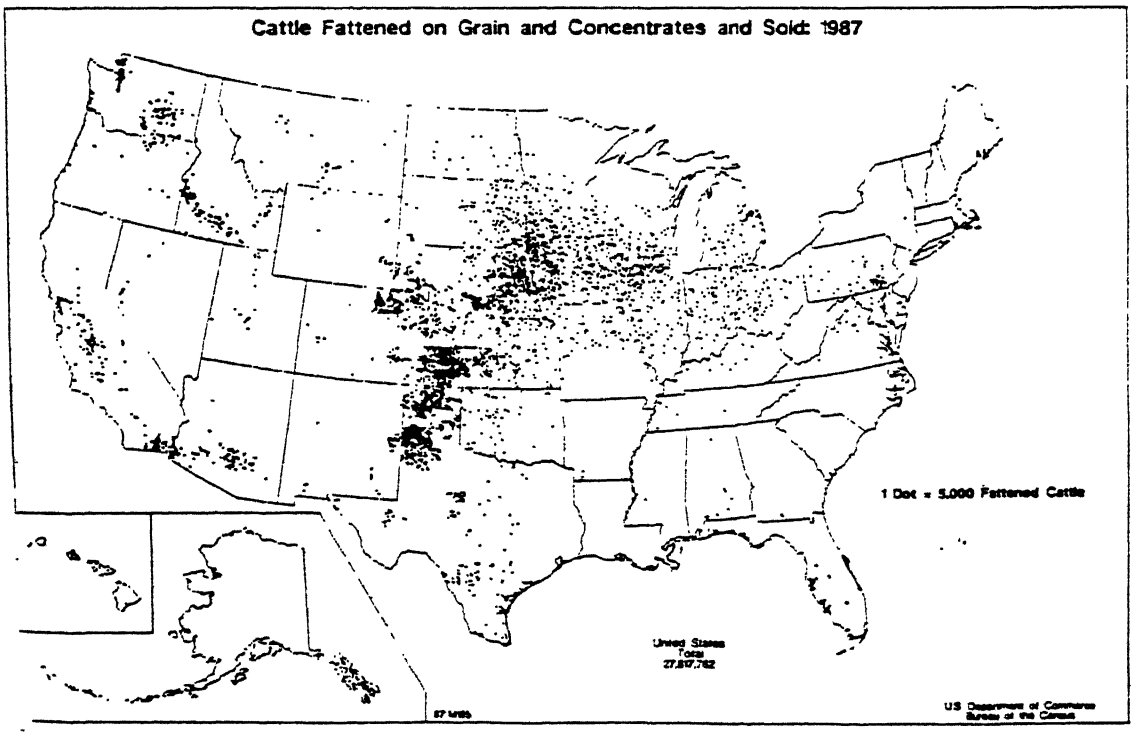
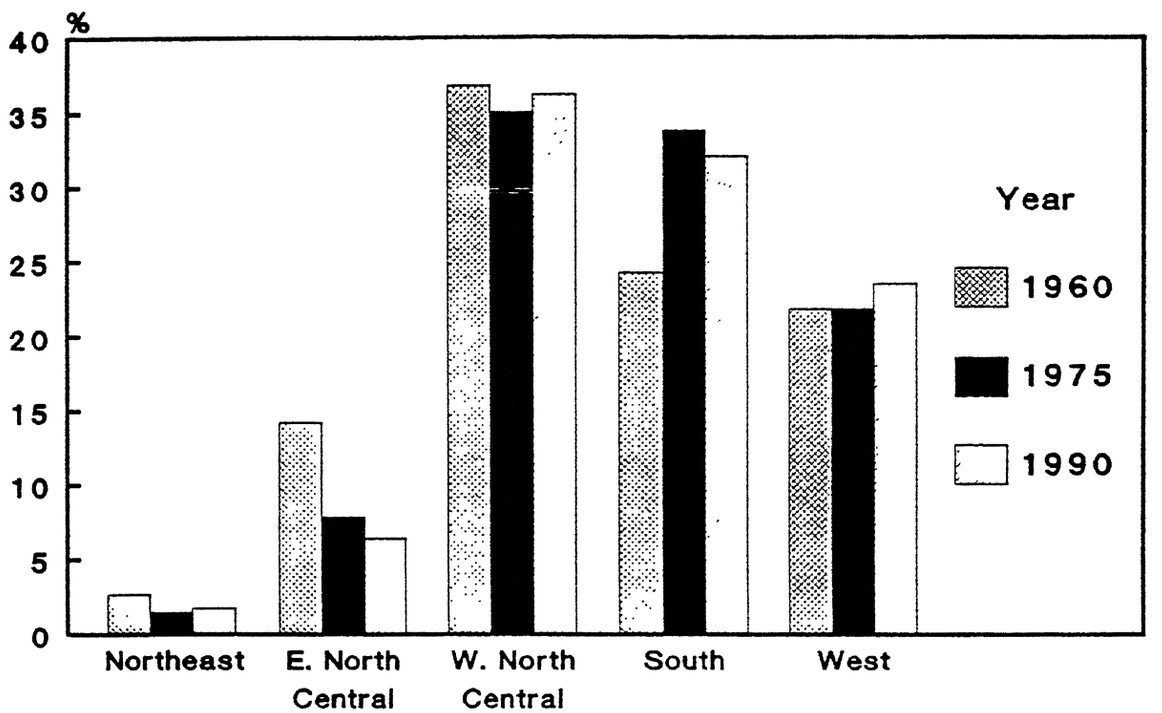


Figure 3. U.S. Cattle Marketings, Regional Shares



Source: Derived from USDA statistics compiled in Stout, T.T. "Patterns of Livestock Production and Slaughter in the U.S.: An Overview." ESO 1934, Department of Agricultural Economics and Rural Sociology, The Ohio State University, April 1992.

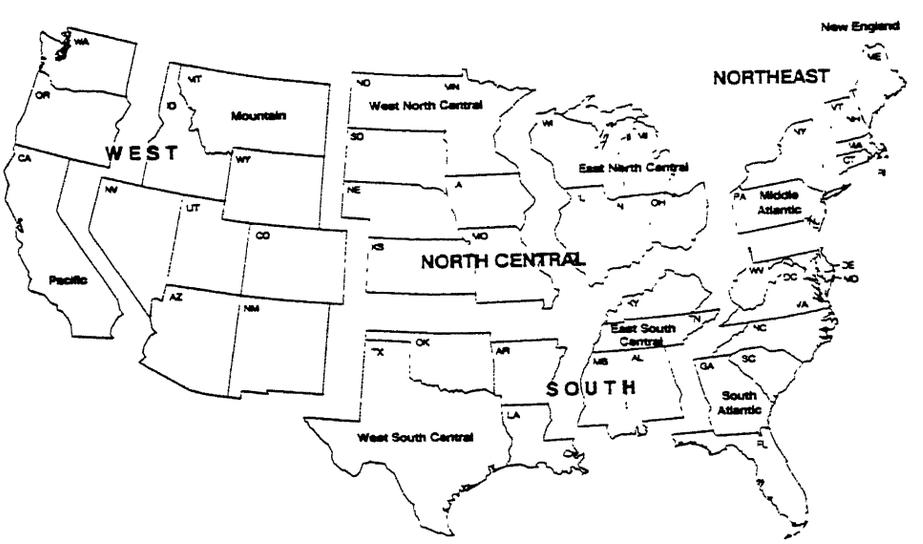
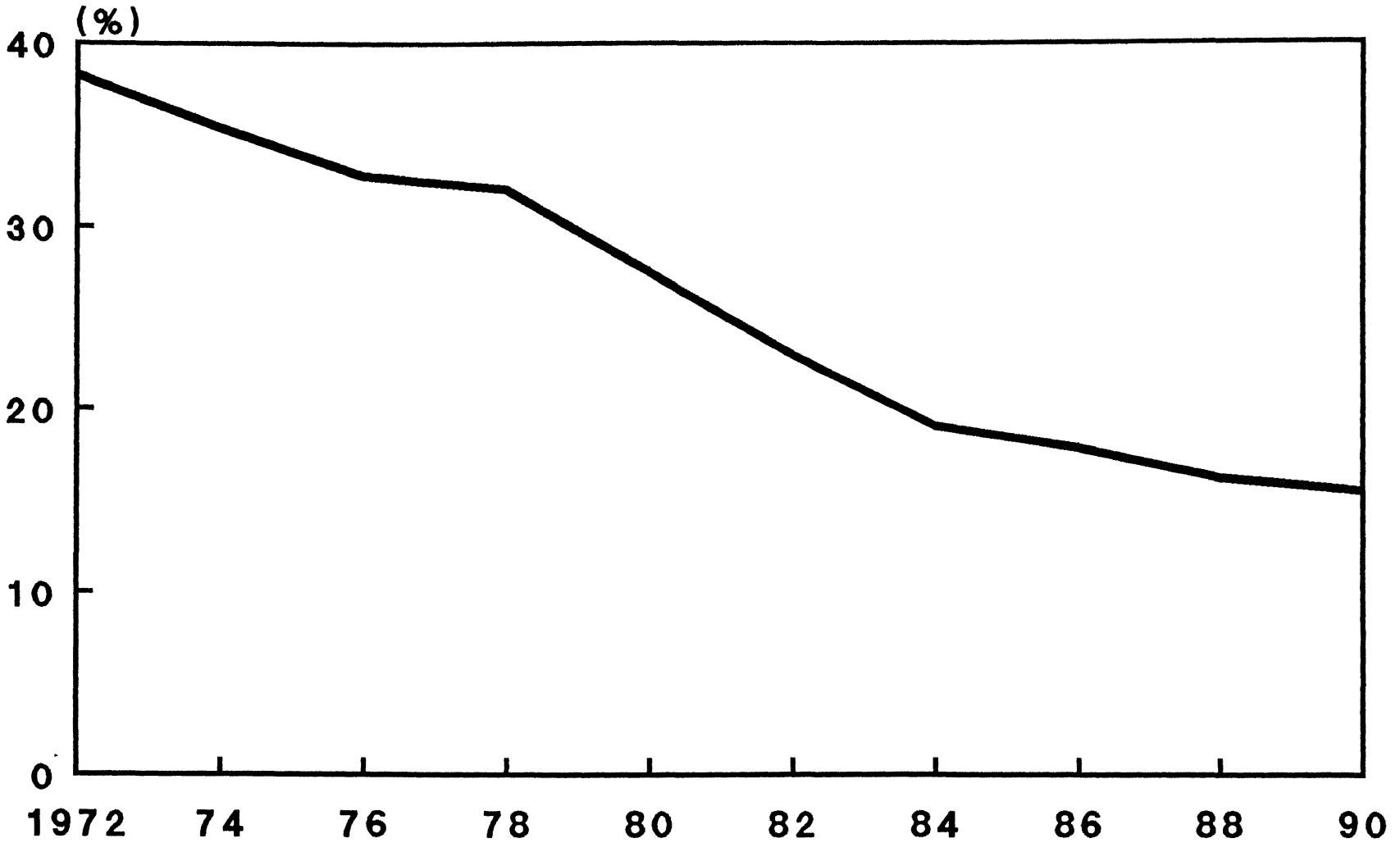
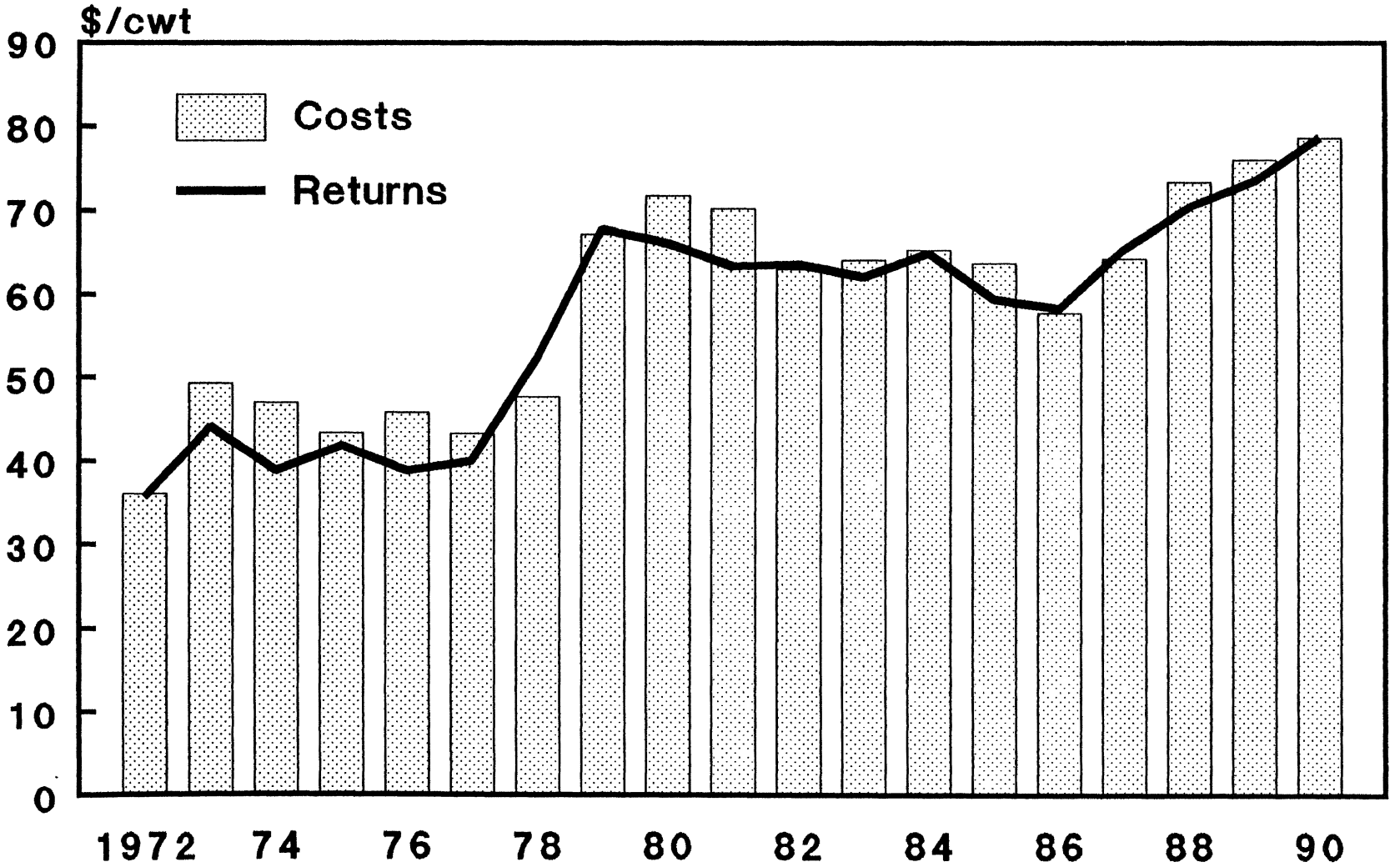


Figure 4. Percent of Fed Cattle Marketed by Feedlots With Less Than 1,000 Capacity



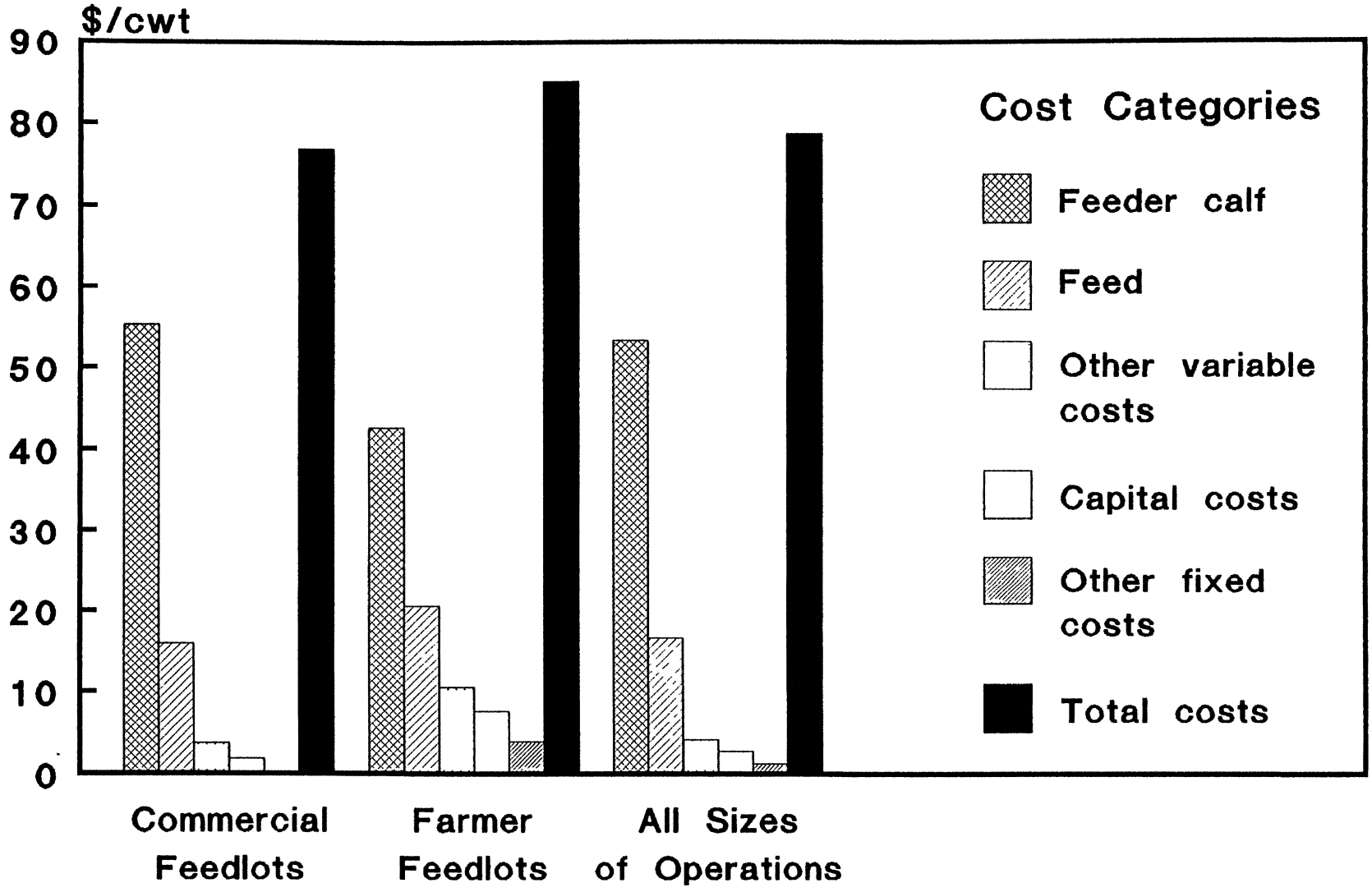
Source: Derived from USDA statistics compiled in Stout, T.T. "Patterns of Livestock Production and Slaughters in the U.S.: An Overview." ESO 1934, Department of Agricultural Economics and Rural Sociology, The Ohio State University, April 1992.

Figure 5. Costs and Returns of U.S. Fed Cattle Production, 1972-90



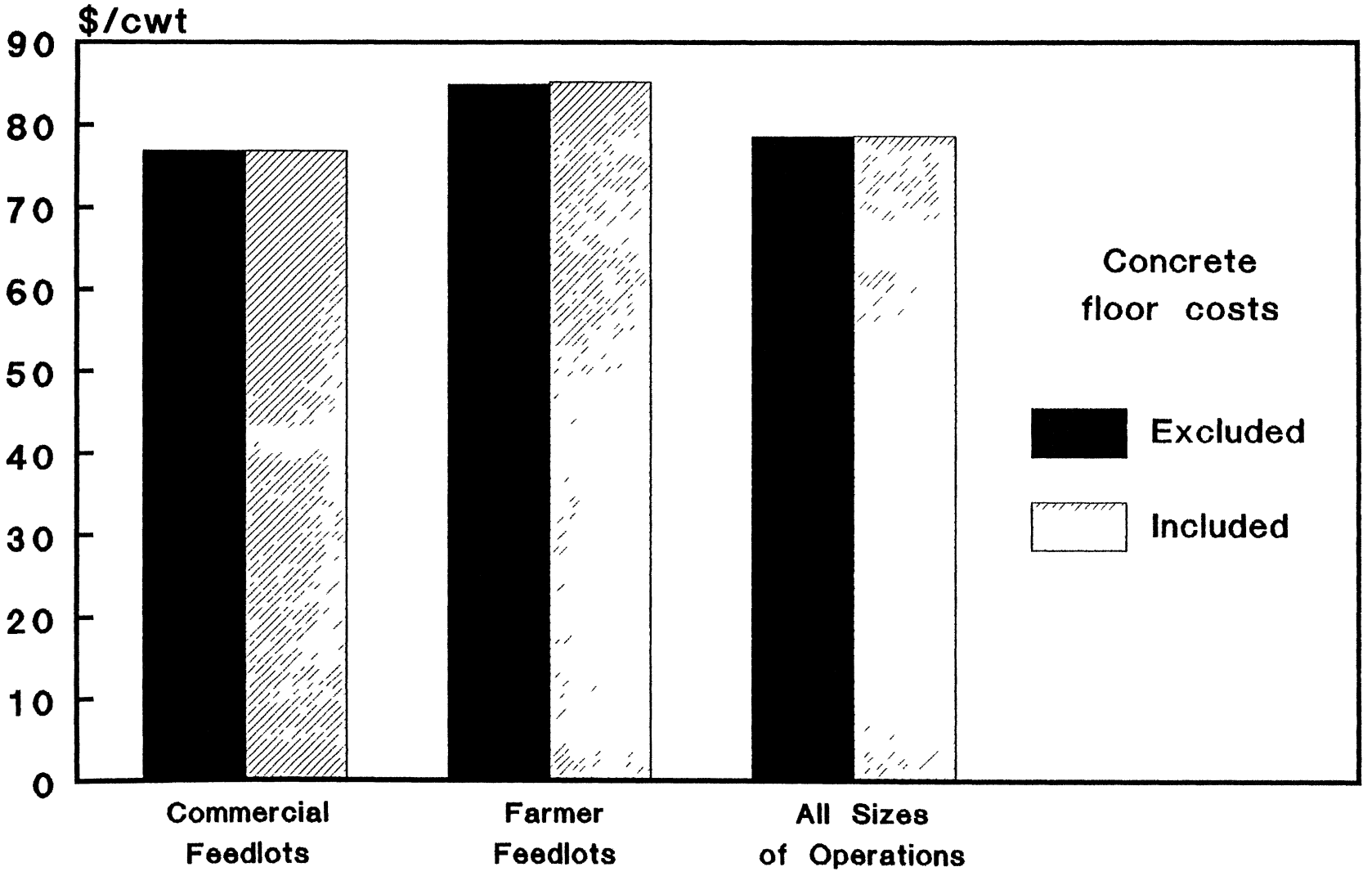
Source: USDA. "Economic Indicators of the Farm Sector: Costs of Production - Livestock and Dairy, 1990." ECIFS 10-5, Economic Research Service, August 1992.

Figure 6. U.S. Fed Cattle, Production Costs, 1990



Source: USDA. "Economic Indicators of the Farm Sector: Costs of Production - Livestock and Dairy, 1990." ECIFS 10-5, Economic Research Service, August 1992.

Figure 7. U.S. Fed Cattle, Production Costs, 1990



Sources: USDA. "Economic Indicators of the Farm Sector: Costs of Production - Livestock and Dairy, 1990." ECIFS 10-5, Economic Research Service, August 1992.
Cost allocation is based on Forster, D.L., L.J. Connor and J.B. Johnson. "Economic Impacts of Selected Water Pollution Control Rules." Research Report 270, Agricultural Experiment Station, Michigan State University, April 1975.